

112740-262

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/936444

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371INTERNATIONAL APPLICATION NO.
PCT/DE00/00761INTERNATIONAL FILING DATE
10 March 2000PRIORITY DATE CLAIMED
11 March 1999

TITLE OF INVENTION

METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED COMMUNICATION NETWORK

APPLICANT(S) FOR DO/EO/US

Werner Stockl et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
- This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
- This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
- A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
- A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - is transmitted herewith (required only if not transmitted by the International Bureau).
 - has been transmitted by the International Bureau.
 - is not required, as the application was filed in the United States Receiving Office (RO/US).
- A translation of the International Application into English (35 U.S.C. 371(c)(2)).
- A copy of the International Search Report (PCT/ISA/210).
- Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - are transmitted herewith (required only if not transmitted by the International Bureau).
 - have been transmitted by the International Bureau.
 - have not been made; however, the time limit for making such amendments has NOT expired.
 - have not been made and will not be made.
- A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
- A copy of the International Preliminary Examination Report (PCT/IPEA/409).
- A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

- An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
- An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- A **FIRST** preliminary amendment.
- A **SECOND** or **SUBSEQUENT** preliminary amendment.
- A substitute specification.
- A change of power of attorney and/or address letter.
- Certificate of Mailing by Express Mail
- Other items or information:

Submission of Drawings - Figures 1-4 on four sheets

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 02/936444	INTERNATIONAL APPLICATION NO. PCT/DE00/00761	ATTORNEY'S DOCKET NUMBER 112740-262
21. The following fees are submitted:		
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :		
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO		\$1,000.00
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO		\$860.00
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO		\$710.00
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)		\$690.00
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)		\$100.00
ENTER APPROPRIATE BASIC FEE AMOUNT = \$860.00		
Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492 (e)).		
\$0.00		
CLAIMS	NUMBER FILED	NUMBER EXTRA
Total claims	9 - 20 =	0
Independent claims	1 - 3 =	0
Multiple Dependent Claims (check if applicable).		<input type="checkbox"/>
TOTAL OF ABOVE CALCULATIONS = \$860.00		
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).		<input type="checkbox"/>
\$0.00		
SUBTOTAL = \$860.00		
Processing fee of \$130.00 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492 (f)).		
\$0.00		
TOTAL NATIONAL FEE = \$860.00		
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).		<input type="checkbox"/>
\$0.00		
TOTAL FEES ENCLOSED = \$860.00		
		Amount to be refunded \$
		charged \$
<input checked="" type="checkbox"/> A check in the amount of \$860.00 to cover the above fees is enclosed.		
<input type="checkbox"/> Please charge my Deposit Account No. in the amount of to cover the above fees. A duplicate copy of this sheet is enclosed.		
<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 02-1818 A duplicate copy of this sheet is enclosed.		
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.		
SEND ALL CORRESPONDENCE TO:		
William E. Vaughan (Reg. No. 39,056) Bell, Boyd & Lloyd LLC P.O. Box 1135 Chicago, Illinois 60690		
		
SIGNATURE		
Robert M. Barrett		
NAME		
30,142		
REGISTRATION NUMBER		
September 11, 2001		
DATE		

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)

Applicant(s): Werner Stockl et al.

Docket No.

112740-262

Serial No.

1036444

Filing Date

Examiner

Group Art Unit

Invention: METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED COMMUNICATION NETWORK

I hereby certify that the following correspondence:

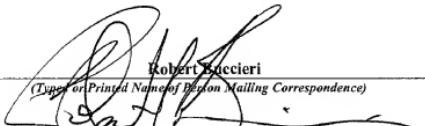
Transmittal letter to the United States Designated/Elected office in duplicate, International application as filed, amended pages, English translation, amended pages, Preliminary Amendment, Submission of Drawings Figures 1-4 on four sheets, IDS, PTO 1449, references, search report, executed declaration and power of attorney, filing fee \$860.00, postcard (see enclosed envelope for executed assignment and fee)

(Identify type of correspondence)

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under

37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for Patents, Washington, D.C. 20231 on

September 11, 2001

(Date)


Robert J. Saccieri
(Type or Printed Name of Person Mailing Correspondence)
(Signature of Person Mailing Correspondence)

EL647240535US

("Express Mail" Mailing Label Number)

Note: Each paper must have its own certificate of mailing.

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

5 APPLICANTS: Werner Stockl et al. DOCKET NO: 112740-262
S SERIAL NO: GROUP ART UNIT:
EXAMINER:
INTERNATIONAL APPLICATION NO: PCT/DE00/00761
10 INTERNATIONAL FILING DATE: 10 March 2000
INVENTION: METHOD FOR DATA TRANSMISSION VIA A PACKET-
ORIENTED COMMUNICATION NETWORK

15 Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

20 **In the Specification:**

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification:

S P E C I F I C A T I O N

TITLE OF THE INVENTION

25 METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED

COMMUNICATION NETWORK

BACKGROUND OF THE INVENTION

The present invention relates to a method for data transmission between the two communications devices via a packet-oriented communications network. In particular, the 30 present invention relates to a transmission system for transmission of timeslot-oriented data between an exchange termination device, frequently referred to as an exchange termination ET, and a line termination LT. According to the terminology of ITU-T Standard G.960 (3/93), "access digital section for ISDN basic rate access" (International Telecommunication Union), in particular pages 2 and 3, the present invention accordingly relates to data 35 transmission at what is referred to as the V-reference point.

5 A transmission system for transmission of timeslot-oriented data between an exchange termination device and a line termination is normally part of a communications system which has a switching device and subscriber access devices. The subscriber access devices in this case have subscriber interfaces for connection of communications terminals to
10 the communications system. The subscriber access devices are, according to ITU-T Standard G.960, connected via a line termination device and an exchange termination device to the switching device in the communications system. Such a communications system is used to allow narrowband communication connections to be set up and cleared between communications terminals connected to the subscriber access devices, and to allow narrowband communication, for example voice or data communication, between the communications terminals.

15 In modern communications systems, data transmission between the exchange termination device and the line termination is, in this case, normally carried out on the basis of the IOM-2 (ISDN Oriented Modular Interface) data format, which is formed from a periodic sequence of channel-specific information segments; hereinafter referred to as a time-division multiplex channel. In this case, one time-division multiplex channel is, in each case, generally assigned to each subscriber interface of a subscriber access device.

20 However, in modern communications technology, there is an increasing requirement for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". As a consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements for data transmission (high speed with a variable transmission bit rate) but also of the requirements for voice data transmission (maintenance of time correlation during data
25 transmission via a communications network) in order to allow the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the Asynchronous Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.
30 In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching data that are relevant for transport for an ATM cell and has a length of five bytes and a 48-byte long payload.

5 Data transmission via an ATM-based communications network generally takes place within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM network nodes in the ATM-based communications network, with switching information including a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual path identification is assigned a VPI value. The switching information entered in the connection table in an ATM network node defines how the virtual paths and virtual channels contained 10 in the virtual paths of the incoming and outgoing connections at the ATM network node are associated with one another via the signaling; that is, which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) essentially have switching data including a 15 VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node; that is, the switching data arranged therein is recorded and assessed. The ATM cells are then passed on by the ATM network node, on the basis of the switching information stored in the connection table, to an ATM network node output which represents a specific destination.

20 The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination device and a line termination, in which the data transmission is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of communications terminals are provided by ATM hub units, as they are referred to in the literature, which are connected to the ATM-based communications network. The exchange 25 termination device in the communications system, and the line termination formed by the ATM hub unit in this case, each have an ATM access unit via which, firstly, a connection to the ATM-based communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and 30 the packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is, in this case, carried out on the basis of two different conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance

with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is, in this case, used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System Interconnection). In the second conversion mode, the timeslot-oriented data is packed in 5 bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented communications network, with the timeslot-oriented IOM-2 data format being used for data 10 transmission between the communications devices. In this case, the information segments are transmitted communications network.

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et al.: "Adaptive Digital Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

The present invention is directed toward specifying an alternative method via which 20 bidirectional data transmission can take place between the communications terminals and the exchange.

SUMMARY OF THE INVENTION

In order to allow better understanding of the method of operation of the transmission of timeslot-oriented data between an exchange termination device and a line termination, it 25 appears to be necessary, first of all, to explain the known principles once again, in more detail.

Transmission of timeslot-oriented data between the exchange termination device and the line termination normally takes place on the basis of the IOM-2 data format which is known, for example, from the product document "ICs for Communications - IOM[®]-2 Interface Reference Guide" from Siemens Munich, 3/91, Order No. B115-H6397-X-X-7600, in particular pages 6 to 12.

Figure 1, which shows a schematic illustration of the IOM-2 data format is intended to allow the relationships to be understood more quickly, on the basis of which time-division

multiple frames IOM-R are transmitted periodically, with a length of 125 μ s. Such a time-division multiplex frame IOM-R is subdivided into time-division multiplex channels or subframes CH0,...,CH7, frequently referred to in the literature just as a "channel". The subframes CH0,...,CH7 are, in turn, each subdivided into two 8-bit long user data channels 5 B1, B2, into an 8-bit long monitor channel M, into a 2-bit long signaling channel DI, into a 4-bit long status channel C/I (Command / Indicate) via two monitor status channels MR, MX, which each have a length of 1 bit. The signaling channel DI, the status channel C/I and the two monitor status channels MR, MX are normally referred to in summarized form in the literature as the control channel D.

10 User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate of 64 kbps, in each case. Control information associated with the transmission of user data information is transmitted via the signaling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, *inter alia*, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit) are, in this case, used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus ($MR = 1$, $MX = 0$), or is emitted to the IOM-2 bus ($MR = 0$, $MX = 1$). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel 15 C/I.

20 Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network via ATM cells in accordance with the first ATM adaptation layer AAL1 since, irrespective of whether data is or is not actually being transmitted, all the channel information (information for the 25 two user data channels B1, B2, for the monitor channel M and for the control channel D) must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network via ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information 30 items, transmitting up-to-date data. Modules which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

A major advantage of the method according to the present invention is now that the method can be implemented in a simple manner in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T

5 Standard G.960.

A further advantage of the method according to the present invention is that the transmission of the information segments which are intended for transmission of signaling information, this corresponding to the data transmitted using the signaling channel in the IOM-2 data format, and of the information segments which are intended for transmission of 10 user data information, this corresponding to the data transmitted via the user data channels in the IOM-2 data format, in separate data cells allows for user data information to be transmitted via the packet-oriented communications network only in situations in which user data actually need to be transmitted in the information segments intended for this purpose.

One advantage of the refinements of an embodiment of the present invention is, inter alia, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network via ATM cells in accordance with the fifth ATM adaptation layer AAL5, so that no new developments are required.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

20 BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic illustration of the IOM-2 data format.

Figure 2 shows a structogram schematically illustrating the major function of units involved in the method according to the present invention.

Figure 3 shows a structogram schematically illustrating the virtual channels which are 25 set up in accordance with a first transmission mode for data transmission via an ATM-based communications network.

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

30 DETAILED DESCRIPTION OF THE INVENTION

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to

the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-KN. Communications terminals KE1,...,KEN are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally

5 connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN via interfaces derived from this, U_{p0} interfaces. In general, a U_{p0} or S_0 interface includes, firstly, two user data channels which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps and, secondly, a
10 signaling channel which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog communications terminals, for example a facsimile terminal can be connected to the ATM-based communications network ATM-KN via a/b interfaces.

15 The communications terminals KE1,...,KEN are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 via network terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected, in a corresponding manner to the exchange termination device ET in the exchange PBX, via an access unit AE to the ATM-based communications network ATM-KN.

20 Data can be transmitted via the ATM-based communications network ATM-KN using two different transmission modes which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN, frequently referred to as a virtual connection VC in the literature, using the first transmission mode. When data is transmitted via the ATM-based communications network ATM-KN using the
30 first transmission mode, the signaling information which is provided by a signaling unit (not illustrated) in the exchange PBX, in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format, is transmitted via the ATM-based communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may, in this case, be a connection

set up at that time for the transmission of signaling information or, alternatively, a permanent connection set up in the ATM-based communications network ATM-KN at an administratively predefined transmission bit rate of, for example, 16 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

5 Signaling information is transmitted via the virtual connection VC-DI via ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H, as it is frequently referred to in the literature, which has a length of 5 bytes and contains switching data relevant for the transport of an ATM cell ATMZ, and a payload field, as it is frequently referred to in the literature, with a length of 48 bytes. The
10 use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation Layer) is, in this case, used for matching the ATM cell format (layer 2 of the OSI reference
15 model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).

Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also requires that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based communications network ATM-KN between the exchange PBX and the ATM hub unit ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.

20 The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX (in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format) is transmitted in an analogous manner to the signaling information via the ATM-based communications network ATM-KN using a virtual connection VC-MC which is provided exclusively for this purpose. To assist clarity, the
25 information to be transmitted within the status channel C/I and the monitor status channels MR, MX using the IOM-2 data format is combined, for short, by the designation C in Figure 3. IOM-2 data-format-specific information is likewise transmitted via the virtual connection VC-MC via ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5.

The user data information, in a corresponding manner to that within the user channels B1, B2 in the IOM-2 data format, for data to be transmitted is transmitted via a virtual connection VC-B via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1. In this case, depending on the bandwidth required for the communications terminals 5 KE1,...,KE_n which are connected to an ATM hub unit ATM-HUB, user data information for only one user data channel or for a number of user data channels can, in this case, be transmitted in combined form via the virtual connection VC-B. In this way, transmission bit rates of integer multiples of 64 kbps can be provided via the virtual connection VC-B. By way of example, in Figure 3, user data information for two user data channels B1, B2 is being 10 transmitted via the virtual connection VC-B and a transmission bit rate, resulting from this, of 128 kbps.

The data transmitted within the virtual connections VC-DI, VC-MC, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB as shown in Figure 3. When no data is actually being transmitted, corresponding blank data is inserted in the IOM-2 data stream. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format, and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX, in a corresponding manner to the data to be transmitted within the 20 monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format, are transmitted jointly via the ATM-based communications network ATM-KN, via ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose. The virtual connection VC-MD can, in this case, once again be a connection which is set up at the time 25 for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH which essentially has a length identification (not illustrated) which defines the number of data bytes transmitted in the respective packet element.

The user data information, in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format, is transmitted in an analogous

10 manner to the first transmission mode via a virtual connection VC-B via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in Figure 4. When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream in a corresponding manner. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information and the user data information via the ATM-based communications network ATM-KN allow for transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN to be taken from the ATM-based communications network ATM-KN only when user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are

25 transmitted via the ATM-based communications network ATM-KN, and the user data information which is actually to be transmitted is then transmitted once this has been done.

Although the present invention has been described with reference to specific embodiments, those with skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter

30 appended claims.

ABSTRACT OF THE DISCLOSURE

In the present communications system, communications terminals are connected via at least one hub unit and an exchange to a packet-based communications network. A timeslot-oriented data format, which is formed from a periodic sequence of channel-specific

information segments, is provided for data transmission between the exchange and the communications terminals. In this case, information segments which are intended for transmission of signaling information, and information segments which are intended for transmission of user data information are transmitted in separate data packets which are intended for data transmission via the packet-oriented communications network.

5 On page 14, cancel line 1, and substitute the following left-hand justified heading therefor:

CLAIMS

Please cancel 1-10, without prejudice, and substitute the following claims therefor:

10 11. A method for data transmission between communications devices via a packet-oriented communications network, a method comprising the steps of:

providing a time-slot oriented data format, formed from a periodic sequence of channel-specific information segments, for data transmission between the communications devices, the data format having information segments for transmitting signaling information, information segments for transmitting user data information, and information segments for transmitting data-format-specific information;

transmitting the information segments intended for transmitting the signaling information in first data packets which are intended for data transmission via the packet-oriented communications network; and

20 transmitting the information segments intended for transmitting the user data information in second information segments which are intended for transmitting the data-format-specific information, using second data packets which are intended for data transmission via the packet-oriented communications network.

25 12. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the second information segments and the information segments intended for transmitting the signaling information are transmitted jointly in the first data packets.

30 13. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 12, the method further comprising the step of:

subdividing the first data packets into at least two packet elements, the second information segments being transmitted in the first packet element, and the information

segments intended for transmitting the signaling information being transmitted in the second packet element.

14. A method for data transmission between communications devices via a
5 packet-oriented communications network as claimed in claim 13, wherein each of the first
and second packet elements have a cell header with a length identification, the length
identification defining a number of data items transmitted in the respective packet element.

15. A method for data transmission between communications devices via a
10 packet-oriented communications network as claimed in claim 11, wherein the timeslot-
oriented data format is the standardized IOM-2 data format.

16. A method for data transmission between communications devices via a
packet-oriented communications network as claimed in claim 11, wherein the data
transmission via the packet-oriented communications network takes place on the basis of the
ATM data format.

17. A method for data transmission between communications devices via a
packet-oriented communications network as claimed in claim 16, wherein the information
20 segments intended for transmitting the signaling information are transmitted via the packet-
oriented communications network in data packets designed in accordance with the fifth ATM
adaptation layer agreement.

18. A method for data transmission between communications devices via a
25 packet-oriented communications network as claimed in claim 16, wherein the information
segments intended for transmitting the user data information are transmitted via the packet-
oriented communications network in data packets designed in accordance with the first ATM
adaptation layer agreement.

30 19. A method for data transmission between communications devices via a
packet-oriented communications network as claimed in claim 11, wherein the information
segments intended for transmitting the signaling information are transmitted via an existing
tie line in the packet-oriented communications network.

20. A method for data transmission between communications devices via a packet-oriented communications network as claimed in claim 11, wherein the information segments intended for transmitting the signaling information are transmitted via a packet-oriented communications network using a connection which is set up, specifically for this
5 data transmission, between the communications devices.

R E M A R K S

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached
10 hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "Version With Markings To Show Changes Made".

In addition, the present amendment cancels original claims 1-10 in favor of new claims 11-20. Claims 11-20 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-10 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§103, 102, 103 or 112. Indeed, the cancellation of claims 1-10 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-10.

Early consideration on the merits is respectfully requested.

Respectfully submitted,



(Reg. No. 30,142)

25
30
Robert M. Barrett
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690-1135
(312) 807-4292
Attorneys for Applicants

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

The Specification of the present application, including the Abstract, has been amended as follows:

S P E C I F I C A T I O N

5

TITLE OF THE INVENTION

METHOD FOR DATA TRANSMISSION VIA A PACKET-ORIENTED

COMMUNICATION NETWORK

BACKGROUND OF THE INVENTION

Description

10 The present invention relates to a method for data transmission between the two communications devices via a packet-oriented communications network ~~as claimed in the precharacterizing clause of patent claim 1~~. In particular, the present invention relates to a transmission system for transmission of timeslot-oriented data between an exchange termination device-, frequently referred to as an exchange termination ET ~~in the literature~~, and a line termination LT, ~~as it is frequently referred to in the literature~~. According to the terminology of ITU-T Standard G.960 (3/93), "access digital section for ISDN basic rate access" (International Telecommunication Union), in particular pages 2 and 3, the present invention accordingly relates to data transmission at what is referred to as the V-reference point.

20 A transmission system for transmission of timeslot-oriented data between an exchange termination device and a line termination is normally part of a communications system which has a switching device and subscriber access devices. The subscriber access devices in this case have subscriber interfaces for connection of communications terminals to the communications system. The subscriber access devices are, according to ITU-T Standard 25 G.960, connected via a line termination device and an exchange termination device to the switching device in the communications system. Such a communications system is used to allow narrowband communication connections to be set up and cleared between communications terminals connected to the subscriber access devices, and to allow narrowband communication-, for example voice or data communication-, between the 30 communications terminals.

 In modern communications systems, data transmission between the exchange termination device and the line termination is, in this case, normally carried out on the basis of the IOM-2 (ISDN Oriented Modular Interface) data format, which is formed from a periodic sequence of channel-specific information segments-; hereinafter referred to as a

time-division multiplex channel ~~from now on~~. In this case, one time-division multiplex channel is, in each case, generally assigned to each subscriber interface of a subscriber access device.

However, in modern communications technology, there is an increasing requirement 5 for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". ~~In~~ As a consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements for data transmission (high speed with a variable transmission bit rate) but also 10 of the requirements for voice data transmission (maintenance of time correlation during data transmission via a communications network); in order ~~in this way~~ to allow the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the 15 Asynchronous Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.

In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching 20 data that are relevant for transport for an ATM cell and has a length of five bytes and a 48-byte long payload.

Data transmission via an ATM-based communications network generally takes place 25 within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM network nodes in the ATM-based communications network, with switching information ~~comprising including~~ a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual path identification is assigned a VPI value. The switching information entered in the 30 connection table in an ATM network node defines how the virtual paths and virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM network node are associated with one another ~~by means of via~~ the signaling; that is to say, which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels) essentially have

switching data ~~comprising~~ including a VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node; that is to say, the switching data arranged therein is recorded and assessed. The ATM cells are then passed on by the ATM network node, on the basis of the switching information stored in the connection 5 table, to an ATM network node output; which represents a specific destination.

The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination device and a line termination, in which the data transmission is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of 10 communications terminals are provided by ATM hub units, as they are referred to in the literature, which are connected to the ATM-based communications network. The exchange termination device in the communications system, and the line termination formed by the ATM hub unit in this case, each have an ATM access unit via which, firstly, a connection to the ATM-based communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and the packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is, in this case, carried out on the basis of two different 20 conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is, in this case, used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System 25 Interconnection). In the second conversion mode, the timeslot-oriented data is packed in bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented 30 communications network, with the timeslot-oriented IOM-2 data format being used for data transmission between the communications devices. In this case, the information segments are transmitted communications network.

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et al.: "Adaptive Digital

Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

5 The present invention is based on the object of directed toward specifying an alternative method, using via which bidirectional data transmission can take place between the communications terminals and the exchange.

10 Based on the features of the precharacterizing clause of patent claim 1, the object is achieved by the characterizing features of this claim:

SUMMARY OF THE INVENTION

In order to allow better understanding of the method of operation of the transmission of timeslot-oriented data between an exchange termination device and a line termination, it appears to be necessary, first of all, to explain the known principles once again, in more detail.

15 Transmission of timeslot-oriented data between the exchange termination device and the line termination normally takes place on the basis of the IOM-2 data format which is known, for example, from the product document "ICs for Communications - IOM[®]-2 Interface Reference Guide" from Siemens Munich, 3/91, Order No. B115-H6397-X-X-7600, in particular pages 6 to 12.

20 Figure 1, which shows a schematic illustration of the IOM-2 data format is intended to allow the relationships to be understood more quickly, on the basis of which time-division multiplex frames IOM-R are transmitted periodically, with a length of 125 µs. Such a time-division multiplex frame IOM-R is subdivided into time-division multiplex channels or subframes CH0,...,CH7—also, frequently referred to in the literature just as a "channel". The subframes CH0,...,CH7 are, in turn, each subdivided into two 8-bit long user data channels B1, B2, into an 8-bit long monitor channel M, into a 2-bit long signaling channel DI, into a 4-bit long status channel C/I (Command / Indicate) by means of via two monitor status channels MR, MX, which each have a length of 1 bit. The signaling channel DI, the status channel C/I and the two monitor status channels MR, MX are normally referred to in summarized form in the literature as the control channel D.

30 User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate of 64 kbps, in each case.

Control information associated with the transmission of user data information is transmitted via the signaling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, inter alia, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit)
5 are, in this case, used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus (MR = 1, MX = 0), or is emitted to the IOM-2 bus (MR = 0, MX = 1). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel C/I.

10 Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network ~~by means of~~ ~~via~~ ATM cells in accordance with the first ATM adaptation layer AAL1; since, irrespective of whether data is or is not actually being transmitted, all the channel information -(information for the two user data channels B1, B2, for the monitor channel M and for the control channel D-) must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network ~~by means of~~ ~~via~~ ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information items, transmitting up-to-date data. Modules
20 which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

25 A major advantage of the method according to the present invention is now that the method can be implemented in a simple manner in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T Standard G.960.

30 A further advantage of the method according to the present invention is that the transmission of the information segments which are intended for transmission of signaling information-, this ~~corresponds~~ corresponding to the data transmitted using the signaling channel in the IOM-2 data format-, and of the information segments which are intended for transmission of user data information-, this ~~corresponds~~ corresponding to the data transmitted via the user data channels in the IOM-2 data format-, in separate data cells ~~means that~~ allows ~~for~~ user data information is to be transmitted via the packet-oriented communications

network only in situations in which user data actually need to be transmitted in the information segments intended for this purpose.

~~Advantageous developments of the invention are specified in the dependent claims.~~

One advantage of the refinements of ~~an embodiment of the present invention defined in the dependent claims~~ is, *inter alia*, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network ~~by means of via~~ ATM cells in accordance with the fifth ATM adaptation layer AAL5, so that no new developments are required.

~~Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.~~

BRIEF DESCRIPTION OF THE FIGURES

~~Figure 1 shows a schematic illustration of the JOM-2 data format. An exemplary embodiment of the invention will be explained in more detail in the following text with reference to the drawing, in which:~~

Figure 2 shows a structogram schematically illustrating the major function of units involved in the method according to the present invention;

Figure 3 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a first transmission mode for data transmission via an ATM-based communications network;

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

DETAILED DESCRIPTION OF THE INVENTION

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-KN. Communications terminals KE1,...,KE_n are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN ~~by means of via~~ interfaces derived from this, U_{p0}

interfaces. In general, a U_{p0} or S_0 interface ~~comprises~~ includes, firstly, two user data channels, which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps; and, secondly, a signaling channel, which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog 5 communications terminals, for example a facsimile terminal -can be connected to the ATM-based communications network ATM-KN via a/b interfaces.

The communications terminals KE_1, \dots, KE_n are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 ~~by means of~~ via network 10 terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected, in a corresponding manner to the exchange termination device ET in the exchange PBX, via an access unit AE to the ATM-based communications network ATM-KN.

20 Data can be transmitted via the ATM-based communications network ATM-KN using two different transmission modes, which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN, frequently referred to as a virtual connection VC in the literature, using the first transmission mode. When data is transmitted via the ATM-based communications network ATM-KN using the first transmission mode, the signaling information which is provided by a signaling unit (not 25 illustrated) in the exchange PBX, in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format, is transmitted via the ATM-based communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may, in this case, be a connection set up at that time for the transmission of signaling information or, alternatively, a permanent 30 connection set up in the ATM-based communications network ATM-KN at an administratively predefined

transmission bit rate of, for example, 16 kbps, between the exchange PBX and the ATM hub unit ATM-HUB.

Signaling information is transmitted via the virtual connection VC-DI ~~by means of via~~ ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H₂ as it is frequently referred to in the literature₂, which has a length of 5 bytes and contains switching data relevant for the transport of an ATM cell 5 ATMZ, and a payload field₂, as it is frequently referred to in the literature₂, with a length of 48 bytes. The use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation 10 Layer) is, in this case, used for matching the ATM cell format (layer 2 of the OSI reference model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).

Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also ~~means~~ requires that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based communications network ATM-KN, between the exchange PBX and the ATM hub unit ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.

20 The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX -(in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels

MR, MX in the IOM-2 data format-) is transmitted in an analogous manner to the signaling information via the ATM-based communications network ATM-KN using a virtual 25 connection VC-MC which is provided exclusively for this purpose. To assist clarity, the information to be transmitted within the status channel C/I and the monitor status channels MR, MX using the IOM-2 data format is combined, for short, by the designation C in the figure Figure 3. IOM-2 data-format-specific information is likewise transmitted via the virtual connection VC-MC ~~by means of via~~ ATM cells ATMZ in accordance with the fifth 30 ATM adaptation layer AAL5.

The user data information₂, in a corresponding manner to that within the user channels B1, B2 in the IOM-2 data format₂, for data to be transmitted is transmitted via a virtual connection VC-B ~~by means of via~~ ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1. In this case, depending on the bandwidth required for the

communications terminals KE1,...,KE_n which are connected to an ATM hub unit ATM-HUB, user data information for only one user data channel or for a number of user data channels can, in this case, be transmitted in combined form via the virtual connection VC-B. In this way, transmission bit rates of integer multiples of 64 kbps can be provided via the virtual connection VC-B. By way of example, in the figure [Figure 3](#), user data information for two user data channels B₁, B₂ is being transmitted via the virtual connection VC-B and a transmission bit rate, resulting from this, of 128 kbps.

The data transmitted within the virtual connections VC-DI, VC-MC, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB as shown in the figure [Figure 3](#).

10 When no data is actually being transmitted, corresponding blank data is inserted in the IOM-2 data stream. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX-, in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format-, and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX-, in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format-, are transmitted jointly via the ATM-based communications network ATM-KN, ~~by means of~~ [via](#) ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose.

25 The virtual connection VC-MD can, in this case, once again be a connection which is set up at the time for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

30 Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH, which essentially has a length

identification (not illustrated) which defines the number of data bytes transmitted in the respective packet element.

The user data information, in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format, is transmitted in an 5 analogous manner to the first transmission mode via a virtual connection VC-B by means of via ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in the figure Figure 4.

When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream 10 in a corresponding manner. Data originating from the ATM hub unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information and the user data information via the ATM-based communications network ATM-KN mean that allow for transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN are to be taken from the ATM-based communications network ATM-KN only when user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are transmitted via the ATM-based communications network ATM-KN, and the user data information which is actually to be transmitted is then transmitted once this has been done.

Additional features and advantages of Although the present invention has been described with reference to specific embodiments, those with skill in the art will recognize 25 that changes may be made thereto are described in, and will be apparent from, the following Detailed Description of the Invention and the figures.

It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the 30 present invention and without diminishing its intended advantages. It is therefore intended that such changes and modifications be covered by the appended claims. invention as set forth in the hereafter appended claims.

Abstract

Method for data transmission via a packet-oriented communications network

ABSTRACT OF THE DISCLOSURE

In the present communications system, communications terminals (KE1,...,KE_n) are
5 connected via at least one hub unit (ATM-HUB) and an exchange (PBX) to a packet-based
communications network(ATM-KN). A timeslot-oriented data format(IOM-2), which is
formed from a periodic sequence of channel-specific information segments(B1, B2, M, DI,
C), is provided for data transmission between the exchange (PBX) and the communications
terminals(KE1,...,KE_n). In this case, information segments (DI) which are intended for
10 transmission of signaling information, and information segments (B1, B2, M, C) which are
intended for transmission of user data information are transmitted in separate data packets
(ATMZ), which are intended for data transmission via the packet-oriented communications
network(ATM-KN).

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 5210 5211 5212 5213 5214 5215 5216 5217 5218 5219 5220 5221 5222 5223 5224 5225 5226 5227 5228 5229 52210 52211 52212 52213 52214 52215 52216 52217 52218 52219 52220 52221 52222 52223 52224 52225 52226 52227 52228 52229 522210 522211 522212 522213 522214 522215 522216 522217 522218 522219 522220 522221 522222 522223 522224 522225 522226 522227 522228 522229 5222210 5222211 5222212 5222213 5222214 5222215 5222216 5222217 5222218 5222219 5222220 5222221 5222222 5222223 5222224 5222225 5222226 5222227 5222228 5222229 52222210 52222211 52222212 52222213 52222214 52222215 52222216 52222217 52222218 52222219 52222220 52222221 52222222 52222223 52222224 52222225 52222226 52222227 52222228 52222229 522222210 522222211 522222212 522222213 522222214 522222215 522222216 522222217 522222218 522222219 522222220 522222221 522222222 522222223 522222224 522222225 522222226 522222227 522222228 522222229 5222222210 5222222211 5222222212 5222222213 5222222214 5222222215 5222222216 5222222217 5222222218 5222222219 5222222220 5222222221 5222222222 5222222223 5222222224 5222222225 5222222226 5222222227 5222222228 5222222229 52222222210 52222222211 52222222212 52222222213 52222222214 52222222215 52222222216 52222222217 52222222218 52222222219 52222222220 52222222221 52222222222 52222222223 52222222224 52222222225 52222222226 52222222227 52222222228 52222222229 522222222210 522222222211 522222222212 522222222213 522222222214 522222222215 522222222216 522222222217 522222222218 522222222219 522222222220 522222222221 522222222222 522222222223 522222222224 522222222225 522222222226 522222222227 522222222228 522222222229 5222222222210 5222222222211 5222222222212 5222222222213 5222222222214 5222222222215 5222222222216 5222222222217 5222222222218 5222222222219 5222222222220 5222222222221 5222222222222 5222222222223 5222222222224 5222222222225 5222222222226 5222222222227 5222222222228 5222222222229 52222222222210 52222222222211 52222222222212 52222222222213 52222222222214 52222222222215 52222222222216 52222222222217 52222222222218 52222222222219 52222222222220 52222222222221 52222222222222 52222222222223 52222222222224 52222222222225 52222222222226 52222222222227 52222222222228 52222222222229 522222222222210 522222222222211 522222222222212 522222222222213 522222222222214 522222222222215 522222222222216 522222222222217 522222222222218 522222222222219 522222222222220 522222222222221 522222222222222 522222222222223 522222222222224 522222222222225 522222222222226 522222222222227 522222222222228 522222222222229 5222222222222210 5222222222222211 5222222222222212 5222222222222213 5222222222222214 5222222222222215 5222222222222216 5222222222222217 5222222222222218 5222222222222219 5222222222222220 5222222222222221 5222222222222222 5222222222222223 5222222222222224 5222222222222225 5222222222222226 5222222222222227 5222222222222228 5222222222222229 52222222222222210 52222222222222211 52222222222222212 52222222222222213 52222222222222214 52222222222222215 52222222222222216 52222222222222217 52222222222222218 52222222222222219 52222222222222220 52222222222222221 52222222222222222 52222222222222223 52222222222222224 52222222222222225 52222222222222226 52222222222222227 52222222222222228 52222222222222229 522222222222222210 522222222222222211 522222222222222212 522222222222222213 522222222222222214 522222222222222215 522222222222222216 522222222222222217 522222222222222218 522222222222222219 522222222222222220 522222222222222221 522222222222222222 522222222222222223 522222222222222224 522222222222222225 522222222222222226 522222222222222227 522222222222222228 522222222222222229 5222222222222222210 5222222222222222211 5222222222222222212 5222222222222222213 5222222222222222214 5222222222222222215 5222222222222222216 5222222222222222217 5222222222222222218 5222222222222222219 5222222222222222220 5222222222222222221 5222222222222222222 5222222222222222223 5222222222222222224 5222222222222222225 5222222222222222226 5222222222222222227 5222222222222222228 5222222222222222229 52222222222222222210 52222222222222222211 52222222222222222212 52222222222222222213 52222222222222222214 52222222222222222215 52222222222222222216 52222222222222222217 52222222222222222218 52222222222222222219 52222222222222222220 52222222222222222221 52222222222222222222 52222222222222222223 52222222222222222224 52222222222222222225 52222222222222222226 52222222222222222227 52222222222222222228 52222222222222222229 522222222222222222210 522222222222222222211 522222222222222222212 522222222222222222213 522222222222222222214 522222222222222222215 522222222222222222216 522222222222222222217 522222222222222222218 522222222222222222219 522222222222222222220 522222222222222222221 522222222222222222222 522222222222222222223 522222222222222222224 522222222222222222225 522222222222222222226 522222222222222222227 522222222222222222228 522222222222222222229 5222222222222222222210 5222222222222222222211 5222222222222222222212 5222222222222222222213 5222222222222222222214 5222222222222222222215 5222222222222222222216 5222222222222222222217 5222222222222222222218 5222222222222222222219 5222222222222222222220 5222222222222222222221 5222222222222222222222 5222222222222222222223 5222222222222222222224 5222222222222222222225 5222222222222222222226 5222222222222222222227 5222222222222222222228 5222222222222222222229 52222222222222222222210 52222222222222222222211 52222222222222222222212 52222222222222222222213 52222222222222222222214 52222222222222222222215 52222222222222222222216 52222222222222222222217 52222222222222222222218 52222222222222222222219 52222222222222222222220 52222222222222222222221 52222222222222222222222 52222222222222222222223 52222222222222222222224 52222222222222222222225 52222222222222222222226 52222222222222222222227 52222222222222222222228 52222222222222222222229 522222222222222222222210 522222222222222222222211 522222222222222222222212 522222222222222222222213 522222222222222222222214 522222222222222222222215 522222222222222222222216 522222222222222222222217 522222222222222222222218 522222222222222222222219 522222222222222222222220 522222222222222222222221 522222222222222222222222 522222222222222222222223 522222222222222222222224 522222222222222222222225 522222222222222222222226 522222222222222222222227 522222222222222222222228 522222222222222222222229 5222222222222222222222210 5222222222222222222222211 5222222222222222222222212 5222222222222222222222213 5222222222222222222222214 5222222222222222222222215 5222222222222222222222216 5222222222222222222222217 5222222222222222222222218 5222222222222222222222219 5222222222222222222222220 5222222222222222222222221 5222222222222222222222222 5222222222222222222222223 5222222222222222222222224 5222222222222222222222225 5222222222222222222222226 5222222222222222222222227 5222222222222222222222228 5222222222222222222222229 52222222222222222222222210 52222222222222222222222211 52222222222222222222222212 52222222222222222222222213 52222222222222222222222214 52222222222222222222222215 52222222222222222222222216 52222222222222222222222217 52222222222222222222222218 52222222222222222222222219 52222222222222222222222220 52222222222222222222222221 52222222222222222222222222 52222222222222222222222223 52222222222222222222222224 52222222222222222222222225 52222222222222222222222226 52222222222222222222222227 52222222222222222222222228 52222222222222222222222229 522222222222222222222222210 522222222222222222222222211 522222222222222222222222212 522222222222222222222222213 522222222222222222222222214 522222222222222222222222215 522222222222222222222222216 522222222222222222222222217 522222222222222222222222218 522222222222222222222222219 522222222222222222222222220 522222222222222222222222221 522222222222222222222222222 522222222222222222222222223 522222222222222222222222224 522222222222222222222222225 522222222222222222222222226 522222222222222222222222227 522222222222222222222222228 522222222222222222222222229 5222222222222222222222222210 5222222222222222222222222211 5222222222222222222222222212 5222222222222222222222222213 5222222222222222222222222214 5222222222222222222222222215 5222222222222222222222222216 5222222222222222222222222217 5222222222222222222222222218 5222222222222222222222222219 5222222222222222222222222220 5222222222222222222222222221 5222222222222222222222222222 5222222222222222222222222223 5222222222222222222222222224 5222222222222222222222222225 5222222222222222222222222226 5222222222222222222222222227 5222222222222222222222222228 5222222222222222222222222229 52222222222222222222222222210 52222222222222222222222222211 52222222222222222222222222212 52222222222222222222222222213 52222222222222222222222222214 52222222222222222222222222215 52222222222222222222222222216 52222222222222222222222222217 52222222222222222222222222218 52222222222222222222222222219 52222222222222222222222222220 52222222222222222222222222221 52222222222222222222222222222 52222222222222222222222222223 52222222222222222222222222224 52222222222222222222222222225 52222222222222222222222222226 52222222222222222222222222227 52222222222222222222222222228 52222222222222222222222222229 522222222222222222222222222210 522222222222222222222222222211 522222222222222222222222222212 522222222222222222222222222213 522222222222222222222222222214 522222222222222222222222222215 522222222222222222222222222216 522222222222222222222222222217 522222222222222222222222222218 522222222222222222222222222219 522222222222222222222222222220 522222222222222222222222222221 522222222222222222222222222222 522222222222222222222222222223 522222222222222222222222222224 522222222222222222222222222225 522222222222222222222222222226 522222222222222222222222222227 522222222222222222222222222228 522222222222222222222222222229 5222222222222222222222222222210 5222222222222222222222222222211 5222222222222222222222222222212 5222222222222222222222222222213 5222222222222222222222222222214 5222222222222222222222222222215 5222222222222222222222222222216 5222222222222222222222222222217 52

09/936444

J002 Rec'd 8:11 AM 70 11 SEP 2001

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

SUBMISSION OF DRAWINGS

APPLICANTS: Werner Stockl et al. DOCKET NO.: 112740-262
SERIAL NO: GROUP ART UNIT:
FILED: EXAMINER:
INTERNATIONAL APPLICATION NO. PCT/DE00/00761
INTERNATIONAL FILING DATE: 10 March 2000
INVENTION: METHOD FOR DATA TRANSMISSION VIA A PACKET-
ORIENTED COMMUNICATION NETWORK

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Applicant herewith submits four sheets (Figs. 1-4) of drawings for the above-referenced PCT application.

Respectfully submitted,



(Reg. No. 30,142)

Robert M. Barrett
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690-1135
(312) 807-4292
Attorneys for Applicants

GR 99 P 1405

Description

48/3

Method for data transmission via a packet-oriented communications network

5

The invention relates to a method for data transmission between the two communications devices via a packet-oriented communications network as claimed in the precharacterizing clause of patent claim 1. In particular, the invention relates to a transmission system for transmission of timeslot-oriented data between an exchange termination device - frequently referred to as an exchange termination ET in the literature - and a line termination LT, as it is frequently referred to in the literature. According to the terminology of ITU-T Standard G.960 (3/93), "access digital section for ISDN basic rate access" (International Telecommunication Union), in particular pages 2 and 3, the invention accordingly relates to data transmission at what is referred to as the v-reference point.

A transmission system for transmission of timeslot-oriented data between an exchange termination device and a line termination is normally part of a communications system which has a switching device and subscriber access devices. The subscriber access devices in this case have subscriber interfaces for connection of communications terminals to the communications system. The subscriber access devices are, according to ITU-T Standard G.960, connected via a line termination device and an exchange termination device to the switching device in the communications system. Such a communications system is used to allow narrowband communication connections to be set up and cleared between communications terminals connected to the subscriber access devices, and to allow narrowband

communication - for example voice or data communication
- between the communications terminals.

In modern communications systems, data transmission between the exchange termination device and the line termination is in this case normally carried out on the basis of the IOM-2 (ISDN Oriented Modular Interface)
5 data format, which is formed from a periodic sequence of channel-specific information segments - referred to as a time-division multiplex channel from now on. In this case, one time-division multiplex channel is in each case generally assigned to each subscriber
10 interface of a subscriber access device.

However, in modern communications technology, there is an increasing requirement for broadband transmission of the information, for example of still images and moving images for video telephone applications, and of large amounts of data for the "Internet". In consequence, the significance of transmission technologies for high and variable data transmission rates (above 100 Mbps) is rising, which take account not only of the requirements 15 for data transmission (high speed with a variable transmission bit rate) but also of the requirements for voice data transmission (maintenance of time correlation during data transmission via a communications network), in order in this way to allow 20 the separate communications networks which exist for the various purposes at the moment to be integrated in one communications network. One known data transmission method for high data rates is the Asynchronous Transfer Mode (ATM). Data transmission based on the Asynchronous 25 Transfer Mode currently allows a variable transmission rate of up to 622 Mbps.

In the cell-based data transmission method which is known as the Asynchronous Transfer Mode (ATM), data 35 packets of a fixed length, which are referred to as ATM cells, are used for data transport. An ATM cell is composed of a cell header which contains switching data

that are relevant for transport for an ATM cell and has a length of five bytes and a

48-byte long payload.

5 Data transmission via an ATM-based communications network generally takes place within the framework of virtual paths, or virtual channels contained in the virtual paths. To this end, when setting up a connection by interchanging signaling information before the start of the actual user data transmission, connection tables are set up in the respective ATM

10 10 network nodes in the ATM-based communications network, with switching information comprising a virtual channel identification and a virtual path identification. In the connection tables, the virtual channel identification is assigned a VCI value, and the virtual

15 15 path identification is assigned a VPI value. The switching information entered in the connection table in an ATM network node defines how the virtual paths and virtual channels contained in the virtual paths of the incoming and outgoing connections at the ATM

20 20 network node are associated with one another by means of the signaling, that is to say which input is linked in switching terms to which output of the ATM network node. ATM cells transmitted via these virtual connections (virtual paths and virtual channels)

25 25 essentially have switching data comprising a VPI value and a VCI value in the cell header. The ATM cell header data is processed at the input of an ATM network node, that is to say the switching data arranged therein is recorded and assessed. The ATM cells are then passed on

30 30 by the ATM network node, on the basis of the switching information stored in the connection table, to an ATM network node output, which represents a specific destination.

35 The German Patent Application with the official reference 198 45 038.9 has already proposed a transmission system between an exchange termination

TELETYPE: FRANZIS 32660

GR 99 P 1405

- 3a -

device and a line termination, in which the data transmission

卷之三

is implemented via an ATM-based communications network. In this case, subscriber interfaces for connection of communications terminals are provided by ATM hub units, as they are referred to in the literature, which are 5 connected to the ATM-based communications network. The exchange termination device in the communications system, and the line termination formed by the ATM hub unit in this case each have an ATM access unit via which, firstly, a connection to the ATM-based 10 communications network is provided and, secondly, bidirectional conversion is carried out between the timeslot-oriented IOM-2 data format, which is normally provided for data transmission between the exchange termination device and the line termination, and the 15 packet-oriented ATM data format.

The bidirectional conversion between the timeslot-oriented IOM-2 data format and the packet-oriented ATM data format is in this case carried out on the basis of 20 two different conversion modes. According to the first conversion mode, based on the CES 2.0 Standard from ATM forum, the timeslot-oriented data is packed in bytes into ATM cells in accordance with the first ATM adaptation layer AAL1. The ATM adaptation layer AAL is 25 in this case used for matching the ATM data format (which corresponds to layer 2 in the OSI reference model) to the network layer (layer 3) in the OSI reference model (Open System Interconnection). In the 30 second conversion mode, the timeslot-oriented data is packed in bytes into ATM cells which are sub-structured in accordance with the second ATM adaptation layer AAL2.

Furthermore, German Laid-Open Specification 35 DE 196 04 245 A1 likewise discloses a method for data transmission between two communications devices via a packet-oriented communications network, with the timeslot-oriented IOM-2 data format being used for data

transmission between the communications devices. In this case, the information segments are transmitted jointly in one ATM cell via the packet-oriented communications network.

5

A method for data transmission between two communications devices via a packet-oriented communications network is likewise known from Dail J. E. et. al.: "Adaptive Digital Access Protocol: A MAC Protocol for Multiservice Broadband Access Networks" IEEE Communications Magazine, US, IEEE Service Center, Piscataway, New York, Volume 34, No. 3, March 1, 1996, XP000557382 ISSN: 0163-6804, in particular on pages 104-112, in which signaling information is transmitted in first data packets, and user information is transmitted in second data packets, via the packet oriented communications network.

20 The present invention is based on the object of specifying an alternative method, using which bidirectional data transmission can take place between the communications terminals and the exchange.

User data information is transmitted via the user data channels B1, B2 between devices connected to an IOM-2 bus at a transmission bit rate

00000000000000000000000000000000

of 64 kbps, in each case. Control information associated with the transmission of user data information is transmitted via the signalling channel DI at a transmission bit rate of 16 kbps. The monitor channel is used, *inter alia*, for configuration of devices connected to an IOM-2 bus, based on an "IOM-2 bus master". The monitor status channels MR (Monitor Read) and MX (Monitor Transmit) are in this case used to define whether data is read by the IOM-2 bus from a device connected to the IOM-2 bus (MR = 1, MX = 0), or is emitted to the IOM-2 bus (MR = 0, MX = 1). Information relating to real time requirements that apply to data transmission between the two devices connected to an IOM-2 bus is interchanged via the status channel C/I.

Only one constant transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via an ATM-based communications network by means of ATM cells in accordance with the first ATM adaptation layer AAL1, since, irrespective of whether data is or is not actually being transmitted, all the channel information - information for the two user data channels B1, B2, for the monitor channel M and for the control channel D - must be transmitted using the IOM-2 data format. On the other hand, a variable transmission bit rate can be provided between the exchange and an ATM hub unit for data transmission via the ATM-based communications network by means of ATM cells in accordance with the second ATM adaptation layer AAL2, since it is possible to transmit only individual channel information items, transmitting up-to-date data. Modules which provide bidirectional conversion between a timeslot-oriented IOM-2 data format and the ATM data format in accordance with the second ATM adaptation layer AAL2 cannot, however, be used economically at the moment, for cost reasons.

A major advantage of the method according to the invention is now that the method can be implemented in a simple manner

in already-existing systems without having to carry out any changes to the interface between the exchange and the ATM hub unit - referred to as the V-reference point in accordance with the terminology used in ITU-T 5 Standard G.960.

A further advantage of the method according to the invention is that the transmission of the information segments which are intended for transmission of 10 signaling information - this corresponds to the data transmitted using the signaling channel in the IOM-2 data format - and of the information segments which are intended for transmission of user data information - this corresponds to the data transmitted via the user 15 data channels in the IOM-2 data format - in separate data cells means that user data information is transmitted via the packet-oriented communications network only in situations in which user data actually need to be transmitted in the information segments 20 intended for this purpose.

Advantageous developments of the invention are specified in the dependent claims.

25 One advantage of the refinements of the invention defined in the dependent claims is, inter alia, that already existing AAL5 modules can be used economically for data transmission via the ATM-based communications network by means of ATM cells in accordance with the 30 fifth ATM adaptation layer AAL5, so that no new developments are required.

An exemplary embodiment of the invention will be explained in more detail in the following text with 35 reference to the drawing, in which:

Figure 2 shows a structogram schematically illustrating the major function of units

involved in the method according to the invention;

4343500

Figure 3 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a first transmission mode for data transmission via an ATM-based communications network;

Figure 4 shows a structogram schematically illustrating the virtual channels which are set up in accordance with a second transmission mode for data transmission via the ATM-based communications network.

Figure 2 shows a schematic illustration of an exchange PBX (Private Branch Exchange) having an exchange termination unit ET (Exchange Termination) arranged in it. The exchange termination unit ET is connected to an ATM-based communications network ATM-KN via an access unit AE. Furthermore, ATM hub units ATM-HUB are connected to the ATM-based communications network ATM-KN and have subscriber interfaces for connection of communications terminals to the ATM-based communications network ATM-KN. Communications terminals KE1,...,KEN are illustrated by way of example.

ISDN communications terminals (Integrated Services Digital Network) are normally connected to the ATM-based communications network ATM-KN via an ATM hub unit ATM-HUB, or digital communications terminals are normally connected to the ATM-based communications network ATM-KN by means of interfaces derived from this, U_{p0} interfaces. In general, a U_{p0} or S_0 interface comprises firstly two user data channels, which are configured as ISDN-oriented B-channels each having a transmission base rate of 64 kbps, and secondly a signaling channel, which is configured as an ISDN-oriented D-channel with a transmission bit rate of 16 kbps. Furthermore, in general, analog communications terminals - for example a facsimile terminal - can be

connected to the ATM-based communications network ATM-KN via a/b interfaces.

The communications terminals KE1,...,KE_n are connected to the ATM hub unit ATM-HUB, that is to say the subscriber interfaces are provided, by the ATM hub unit ATM-HUB in accordance with the terminology in ITU-T Standard G.960 by means of network terminations NT (Network Termination). According to ITU-T Standard G.960 (International Telecommunication Union), the network terminations NT on an ATM hub unit ATM-HUB are connected via a line termination LT, which is arranged 5 in the ATM hub unit ATM-HUB, to the exchange termination device ET in the exchange PBX. For data transmission via the ATM-based communications network ATM-KN, the line termination LT is connected - in a corresponding manner to the exchange termination device 10 ET in the exchange PBX - via an access unit AE to the ATM-based communications network ATM-KN. 15

Data can be transmitted via the ATM-based communications network ATM-KN using two different 20 transmission modes, which will be described in more detail in the following text.

Figure 3 shows a schematic illustration of the virtual connections which are set up for data transmission via the ATM-based communications network ATM-KN - frequently referred to as a virtual connection VC in the literature - using the first transmission mode. When data is transmitted via the ATM-based 25 communications network ATM-KN using the first transmission mode, the signaling information which is provided by a signaling unit (not illustrated) in the exchange PBX - in a corresponding way to the data to be transmitted within the signaling channel DI when using the IOM-2 data format - is transmitted via the ATM-based 30 communications network ATM-KN using a virtual connection VC-DI provided exclusively for this purpose. The virtual connection VC-DI may in this case be a 35 connection set up at that time for the transmission of

signaling information or, alternatively, a permanent connection set up in the ATM-based communications network ATM-KN at an administratively predefined

transmission bit rate of, for example, 16 kbps, between the exchange PBX and the ATM hub unit ATM-HUB.

5 Signaling information is transmitted via the virtual connection VC-DI by means of ATM cells ATMZ using the fifth ATM adaptation layer AAL5. An ATM cell ATMZ is in general composed of a cell header H - as it is frequently referred to in the literature - which has a length of 5 bytes and contains switching data relevant
10 for the transport of an ATM cell ATMZ, and a payload field - as it is frequently referred to in the literature - with a length of 48 bytes. The use of ATM cells ATMZ in accordance with the fifth ATM adaptation layer AAL5 for transmission of signaling information
15 allows a variable transmission bit rate to be used between the exchange PBX and the ATM hub unit ATM-HUB via the ATM-based communications network ATM-KN. The ATM adaptation layer AAL (ATM Adaptation Layer) is in this case used for matching the ATM cell format (layer
20 2 of the OSI reference model) to the network layer (layer 3) of the OSI reference model (Open System Interconnection).
25

Transmission of the signaling information via a virtual connection VC-DI at a variable transmission bit rate also means that, in situations in which the signaling information is transmitted via a permanent connection, which is set up in the ATM-based communications network ATM-KN, between the exchange PBX and the ATM hub unit ATM-HUB, transmission resources are taken from the ATM-based communications network ATM-KN only when signaling information is actually being transmitted via the ATM-based communications network ATM-KN.
30

35 The IOM-2 data-format-specific information which is provided by a control unit (not illustrated) in the exchange PBX - in a corresponding manner to the data to

GR 99 P 1405

- 10a -

be transmitted within the monitor channel M, the status
channel C/I and the monitor status channels

5 MR, MX in the IOM-2 data format - is transmitted in an
analogous manner to the signalling information via the
ATM-based communications network ATM-KN using a virtual
connection VC-MC which is provided exclusively for this
10 purpose. To assist clarity, the information to be
transmitted within the status channel C/I and the
monitor status channels MR, MX using the IOM-2 data
format is combined, for short, by the designation C in
15 the figure. IOM-2 data-format-specific information is
likewise transmitted via the virtual connection VC-MC
by means of ATM cells ATMZ in accordance with the fifth
ATM adaptation layer AAL5.

15 The user data information - in a corresponding manner
to that within the user channels B1, B2 in the IOM-2
data format - for data to be transmitted is transmitted
via a virtual connection VC-B by means of ATM cells
ATMZ in accordance with the first ATM adaptation layer
20 AAL1. In this case, depending on the bandwidth required
for the communications terminals KE1,...,KEN which are
connected to an ATM hub unit ATM-HUB, user data
information for only one user data channel or for a
number of user data channels can in this case be
25 transmitted in combined form via the virtual connection
VC-B. In this way, transmission bit rates of integer
multiples of 64 kbps can be provided via the virtual
connection VC-B. By way of example, in the figure, user
data information for two user data channels B1, B2 is
30 being transmitted via the virtual connection VC-B and a
transmission bit rate, resulting from this, of
128 kbps.

35 The data transmitted within the virtual connections VC-
DI, VC-MC, VC-B is inserted into the IOM-2 data stream
in the ATM hub unit ATM-HUB as shown in the figure.
When no data is actually being transmitted,
corresponding blank data is inserted in the IOM-2 data
stream. Data originating from the ATM hub unit ATM-HUB

is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

Figure 4 shows a schematic illustration of the virtual connections which are set up using the second transmission mode for data transmission via the ATM-based communications network ATM-KN. When transmitting data via the ATM-based communications network ATM-KN using the second transmission mode, the signaling information which is provided by the signaling unit in the exchange PBX - in a corresponding manner to the data to be transmitted within the signaling channel DI in the IOM-2 data format - and the IOM-2 data-format-specific information which is provided by the control unit in the exchange PBX - in a corresponding manner to the data to be transmitted within the monitor channel M, the status channel C/I and the monitor status channels MR, MX in the IOM-2 data format - are transmitted jointly via the ATM-based communications network ATM-KN, by means of ATM cells ATMZ in accordance with the fifth adaptation layer AAL5, using a virtual connection VC-MD which is provided exclusively for this purpose. The virtual connection VC-MD can in this case once again be a connection which is set up at the time for transmission of this information or, alternatively, a fixed connection which is set up in the ATM-based communications network ATM-KN, and has an administratively predetermined transmission bit rate of, for example, 128 kbps between the exchange PBX and the ATM hub unit ATM-HUB.

Within the fifth ATM adaptation layer AAL5, the user data area of an ATM cell ATMZ can be subdivided into packet elements TP1, TP2. In the exemplary embodiment above, the signaling information is transmitted in a first packet element TP1, and the IOM-2 data-format-specific information is transmitted in a second packet element TP2. The packet elements TP1, TP2 each have a packet element header SH, which essentially has a length identification (not illustrated) which defines

GR 99 P 1405

- 12a -

the number of data bytes transmitted in the respective
packet element.

2025 RELEASE UNDER E.O. 14176

The user data information - in a corresponding manner to the data to be transmitted within the user data channels B1, B2 in the IOM-2 data format - is transmitted in an analogous manner to the first 5 transmission mode via a virtual connection VC-B by means of ATM cells ATMZ in accordance with the first ATM adaptation layer AAL1.

The data transmitted within the virtual connections VC-10 MD, VC-B is inserted into the IOM-2 data stream in the ATM hub unit ATM-HUB, as illustrated in the figure. When no data is actually being transmitted, blank data is inserted into the IOM-2 data stream in a corresponding manner. Data originating from the ATM hub 15 unit ATM-HUB is transmitted to the exchange PBX in an analogous manner to the described method, but in the opposite direction.

The separate transmission of the signaling information 20 and the user data information via the ATM-based communications network ATM-KN mean that transmission resources for transmission of user data information which is to be transmitted within a connection via the ATM-based communications network ATM-KN are taken from the ATM-based communications network ATM-KN only when 25 user data is actually being transmitted. Thus, for example, in a first step in the setting up of a connection, only the signaling information required for setting up the connection and the IOM-2 data-format-specific information are transmitted via the ATM-based 30 communications network ATM-KN, and the user data information which is actually to be transmitted is then transmitted once this has been done.

Patent Claims

1. A method for data transmission between communications devices via a packet-oriented communications network (ATM-KN),
5 with a timeslot oriented data format (IOM-2), which is formed from a periodic sequence of channel-specific information segments (B1, B2, M, DI, C) being provided for data transmission between the communications devices, and with the data format (IOM-2) having information segments (DI) for transmission of signaling information, information segments (B1, B2) for transmission of user data information, and information segments (M, C) for transmission of data-format-specific information,
10 characterized in that the information segments (DI) intended for transmission of the signaling information are transmitted in first data packets (ATMZ) which are intended for data transmission via the packet-oriented communications network (ATM-KN), and the information segments (B1, B2) which are intended for transmission of user data information are transmitted in second information segments (M, C), which are intended for transmission of data-format-specific information, using third data packets (ATMZ), which are intended for data transmission via the packet-oriented communications network (ATM-KN).
15
20
25
30

2. The method as claimed in claim 1, characterized in that the information segments (M, C) which are intended for transmission of data-format-specific information, and the data segments (DI) which are intended for transmission of signaling

35

1999 01405

- 14a -

information, are transmitted jointly in the first data packets (ATMZ).

2025 RELEASE UNDER E.O. 14176

3. The method as claimed in claim 2,
characterized
in that the first data packets (ATMZ) are
subdivided into at least two packet elements (TP1,
TP2), with the information segments (M, C) which
are intended for transmission of data-format-
specific information being transmitted in a first
packet element (TP1), and the information segments
(DI) which are intended for transmission of
signaling information being transmitted in a
second packet element (TP2).

4. The method as claimed in claim 3,
characterized
in that the packet elements (TP1, TP2) each have a
cell header (SH) with a length identification,
with the length identification defining the number
of data items transmitted in a respective packet
element (TP1, TP2).

5. The method as claimed in one of the preceding
claims,
characterized
in that the timeslot-oriented data format (IOM-2)
is the standardized IOM-2 data format.

6. The method as claimed in one of the preceding
claims,
characterized
in that data transmission via the packet-oriented
communications network (ATM-KN) takes place on the
basis of the ATM data format (Asynchronous
Transfer Mode).

7. The method as claimed in claim 6,
characterized
in that the information segments (DI) which are
intended for transmission of signaling

100-100000-100000

information are transmitted via the packet-oriented communications network (ATM-KN) in data packets (ATMZ) which are designed in accordance with an agreement which is known as the fifth ATM adaptation layer (AAL5).
5

TOP SECRET//intelligence

8. The method as claimed in claim 6 or 7,
characterized
in that the information segments (B1, B2) which
are intended for transmission of use of data
information are transmitted via the packet-
oriented communications network (ATM-KN) in data
packets (ATMZ) which are designed in accordance
with an agreement which is known as the first ATM
adaptation layer AAL1.

10 9. The method as claimed in one of the preceding
claims,
characterized
in that the information segments (DI) which are
intended for transmission of signalling information
are transmitted via an existing tieline in the
packet-oriented communications network (ATM-KN).

15 10. The method as claimed in one of claims 1 to 8,
characterized
in that the information segments (DI) which are
intended for transmission of signalling information
are transmitted via a packet-oriented
communications network (ATM-KN) using a connection
which is set up, specifically for this data
transmission, between the communications devices.

20

25

Abstract

Method for data transmission via a packet-oriented communications network

5

In the present communications system, communications terminals (KE1,...,KEN) are connected via at least one hub unit (ATM-HUB) and an exchange (PBX) to a packet-based communications network (ATM-KN). A timeslot-oriented data format (IOM-2), which is formed from a periodic sequence of channel-specific information segments (B1, B2, M, DI, C), is provided for data transmission between the exchange (PBX) and the communications terminals (KE1,...,KEN). In this case, 10 information segments (DI) which are intended for transmission of signaling information, and information segments (B1, B2, M, C) which are intended for transmission of user data information are transmitted in separate data packets (ATMZ), which are intended for 15 data transmission via the packet-oriented communications network (ATM-KN).

10

15

20

Figure 2

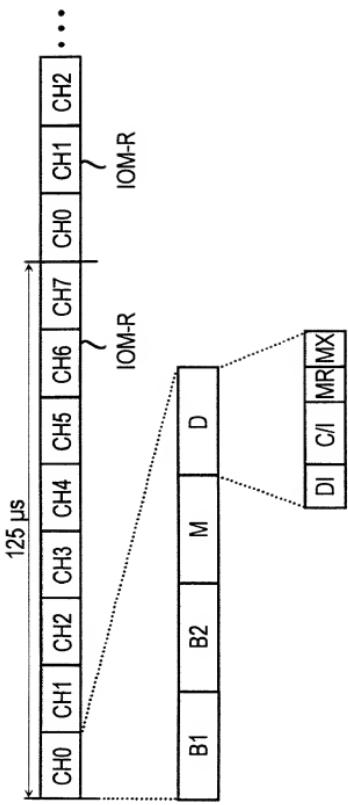


Fig 1

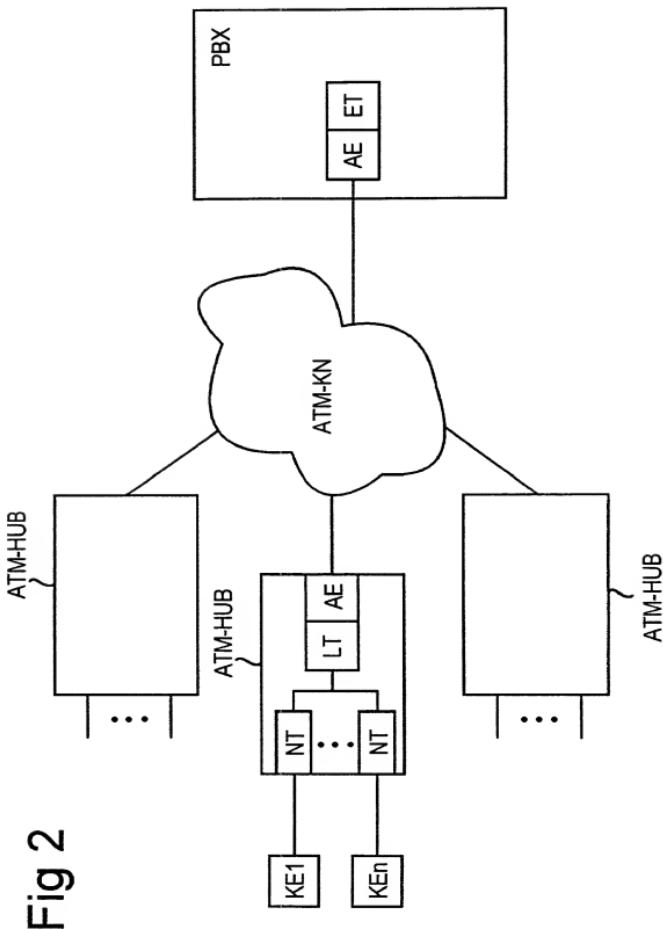


Fig 3

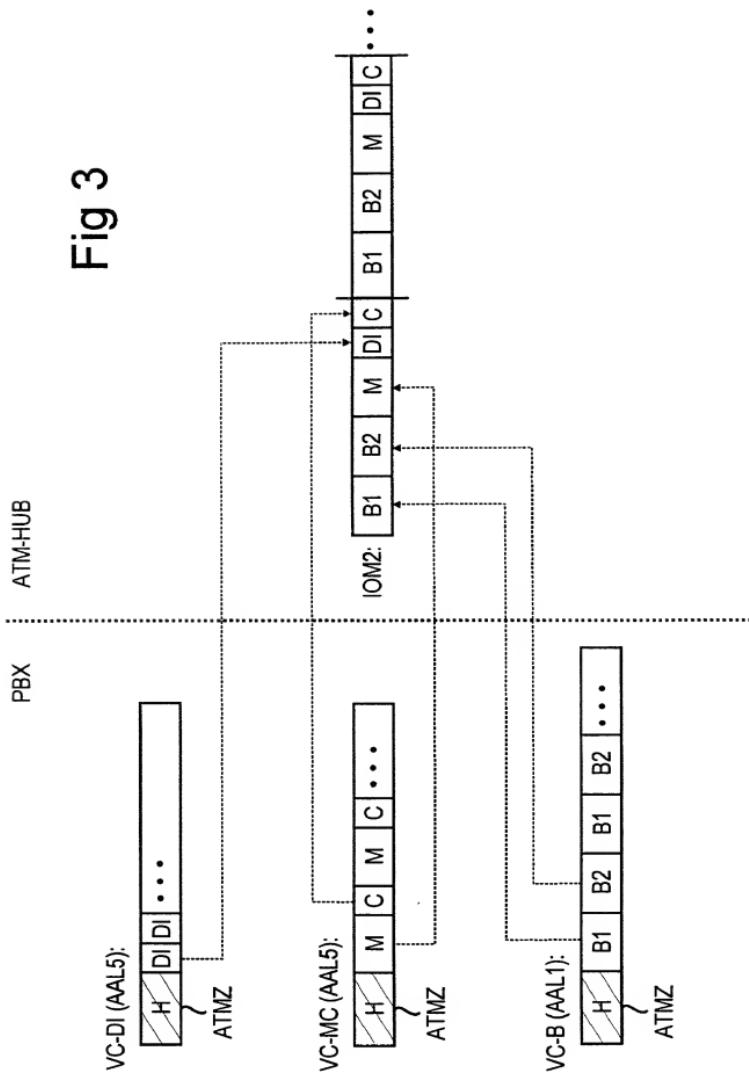
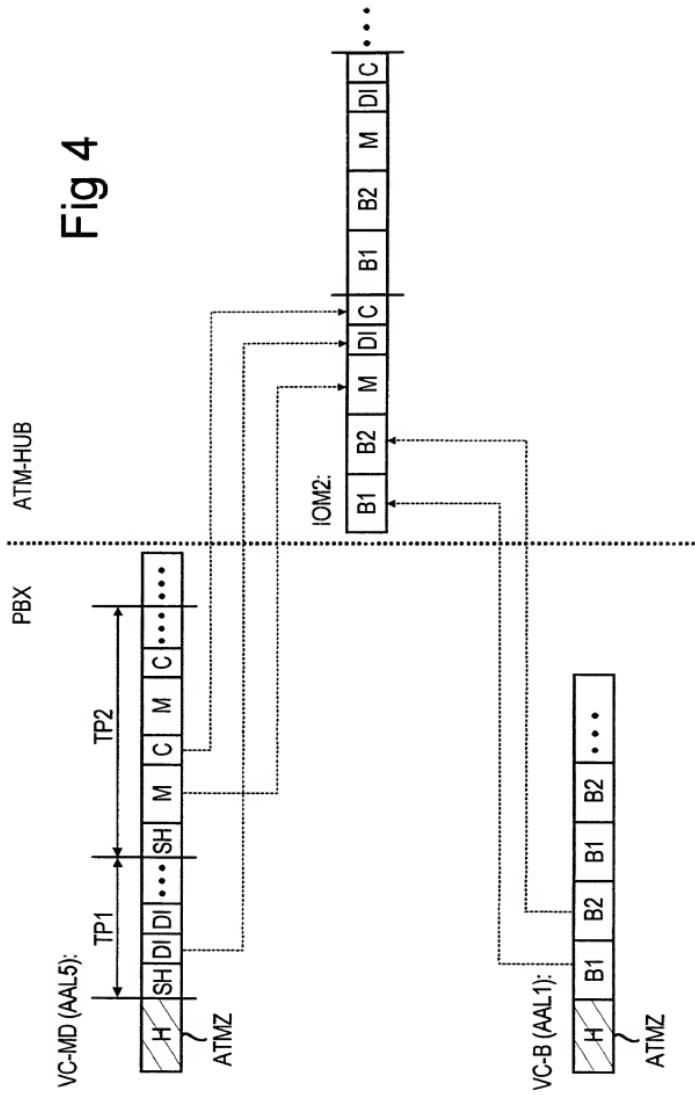


Fig 4



Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
 German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Verfahren zur Dateneübermittlung über ein paket-orientiertes Kommunikationsnetz

deren Beschreibung

(zutreffendes ankreuzen)

hier beigefügt ist.

am 10.03.2000 als

PCT internationale Anmeldung

PCT Anmeldungsnummer PCT/DE00/00761

eingereicht wurde und am _____

abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschließlich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäß Abschnitt 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmelddatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method of transmitting data via a packet-oriented communications network

the specification of which

(check one)

is attached hereto.

was filed on 10.03.2000 as

PCT international application

PCT Application No. PCT/DE00/00761

and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign applications
Priorität beansprucht

Priority Claimed

(Number) (Country) (Day Month Year Filed) Yes
(Nummer) (Land) (Tag Monat Jahr eingereicht) Ja
□ No
□ Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzblatt, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT-internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below, and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/00781 (Application Serial No.) (Anmeldeseriennummer)	10.03.2000 (Filing Date D, M, Y) (Anmeldedatum T, M, J)	anhängig (Status) (patentiert, anhängig, aufgegeben)	pendig (Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending,

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissenschaftlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozeßordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden können, und dass derartig wissenschaftlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: (Name und Registrationsnummer anführen)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Customer No.

And I hereby appoint

Telefongespräche bitte richten an:
(Name und Telefonnummer)

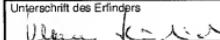
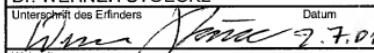
Direct Telephone Calls to: (name and telephone number)

Ext. _____

Postanschrift:

Send Correspondence to:

Bell, Boyd & Lloyd LLC
Three First National Plaza, 70 West Madison Street, Suite 3300 60602-4207 Chicago, Illinois ,
Telephone: (001) 312 372 11 21 and Facsimile (001) 312 372 20 98
or
Customer No.

Voller Name des einzigen oder ursprünglichen Erfinders: KLAUS HUENLICH		Full name of sole or first inventor: KLAUS HUENLICH
Unterschrift des Erfinders 	Datum <i>5.7.01</i>	Inventor's signature Date
Wohnsitz NEUCHING, DEUTSCHLAND	Residence NEUCHING, GERMANY DEX	
Staatsangehörigkeit DE	Citizenship DE	
Postanschrift BIRKENSTR. 4	Post Office Address BIRKENSTR. 4	
85467 NEUCHING	85467 NEUCHING	
Voller Name des zweiten Miterfinders (falls zutreffend): Dr. WERNER STOECKL		Full name of second joint inventor, if any: Dr. WERNER STOECKL
Unterschrift des Erfinders 	Datum <i>2.7.01</i>	Second Inventor's signature Date
Wohnsitz BAIERBRUNN, DEUTSCHLAND	Residence BAIERBRUNN, GERMANY DEX	
Staatsangehörigkeit DE	Citizenship DE	
Postanschrift HERMANN-ROTH-STR. 8	Post Office Address HERMANN-ROTH-STR. 8	
82065 BAIERBRUNN	82065 BAIERBRUNN	

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).